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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/751,230	01/02/2004	Jinbo Xu	GLH 08-896943	1114

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EXAMINER

BORIN, MICHAEL L

ART UNIT PAPER NUMBER

1631

DATE MAILED: 03/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/751,230	<b>Applicant(s)</b> XU ET AL.	
	<b>Examiner</b> Michael Borin	<b>Art Unit</b> 1631	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 December 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-15 is/are pending in the application.  
     4a) Of the above claim(s) 14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 and 15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### ***DETAILED ACTION***

#### **Status of Claims**

1. Response to restriction requirement filed 12/27/2005 is acknowledged. Applicant elected, with traverse, Group I, claims 1-13,15. Applicant argues that the reference made in the restriction requirement about unpatentability of one method vis-a-vis another method is irrelevant to a restriction requirement. Unpatentability of one method vs another is not address in the restriction requirement; the notion that a reference teaching one method would not teach the other was made to indicate the necessity for not co-extensive search. Examiner maintains that a reference teaching method of group I is not expected to teach such limitations of method of Group II as "formulating threading problem as a large scale integer problem", and "relaxing this problem". Further, with respect to argument regarding different classification, the groups have not been indicated as having different classification. The restriction requirement is still deemed proper and is therefore made FINAL. Claim 14 is withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected group. Cancellation of claims 14 is requested.

#### ***Claim Objections***

2. Claim 12 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of the base claim 1. Applicant is required to cancel the claim, or amend the claim to place the claim in proper dependent

form, or rewrite the claim in independent form.

***Claim Rejections - 35 USC § 112, second paragraph.***

The following is a quotation of the second paragraph of 35 U.S.C. 112:  
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The rejection is applied for the following reasons.

A. Claim 1: The term “weighting factors” is not clear. Specification addresses “weight factors” (e.g., p. 6, line 8. Are “weighting factors” is the same as “weight factors”?

B Claim 1: The phrase “energy function being a sum of energy parameters and weighting factors” is not clear: Is “energy function” =  $A+B$ , where A is energy parameters and B is weighting factors? Then, specification does not teach such sum energy parameters and weighting factors. Rather, specification teaches that “energy function” is a sum of energy scores multiplied (not added) by their respective weighting factors. See p. 6, lines 7,8. Please clarify.

C. Claim 1, step “determining”: It is not clear how the values of weighting factors are being determined. The specification refers to general knowledge in the art; however no supporting references describing how the values of weighting factors are to be determined.

D. Claim 3: The claim lacks antecedent basis: the base claim requires that "energy function" is a "sum of energy parameters and weighting factors". The energy function of claim 3 is not a sum of energy parameters and weighting factors.

E. Claims 8-10: The claims are indefinite as they address constraints (8)-(20) without defining them.

MPEP 2173.05(s) requires:

Where possible, claims are to be complete in themselves. Incorporation by reference to a specific figure or table "is permitted only in exceptional circumstances where there is no practical way to define the invention in words and where it is more concise to incorporate by reference than duplicating a drawing or table into the claim. Incorporation by reference is a necessity doctrine, not for applicant's convenience." Ex parte Fressola, 27 USPQ2d 1608, 1609 (Bd. Pat. App. & Inter. 1993)

Equations are viewed as the same type of information as Tables or Figure. The equations , and the parameters used therein, must be recited in the claims.

### ***Claim Rejections - 35 USC § 101***

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 1-13,15 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The instant claims are drawn to a computer process of aligning query protein sequence with protein structures. The method includes computational steps of

selecting functions and constraints, and performing linear programming analysis. The claims do not recite any practical application of the method.

To be statutory, an invention must be directed to one of statutory categories enumerated in 35 USC § 101, or must produce a result which is useful, and tangible, and concrete. In determining if the instant claims are useful, tangible, and concrete, the Examiner must determine each standard individually. For a claim to be “useful,” the claim must produce a result that is specific, substantial, and credible. For a claim to be “tangible,” the claim must set forth a practical application of the invention that produces a real-world result. For a claim to be “concrete,” the process must have a result that can be substantially repeatable or the process must substantially produce the same result again. Furthermore, the claim must recite a useful, tangible, and concrete result in the claim itself.

In addition, a claim must be limited only to statutory embodiments. Thus, if the claim is broader than the statutory embodiments of the claim, the Examiner must reject the claim as non-statutory.

The instant claims do not include any tangible result. A tangible requirement requires that the claim must set forth a practical application of the computational steps to produce a real-world result. No practical result is recited in the claims; thus the instant claims do not include any tangible result.

Furthermore, in regard to claim 15, “Computer-Related Inventions” section of the MPEP at section 2106, Part IV, subpart B, also clarifies that claiming such non-statutory subject matter on a computer medium or in software does not prevent this rejection.

***Claim Rejections - 35 USC § 102 and 103.***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1,2,15 are rejected under 35 U.S.C. 102(b) as anticipated by Meller et al (Meller et al. Proteins: Structure, Function, and Genetics, 2001, Volume 45, Issue 3 , Pages 241 – 261).

The instant claims are drawn to method of aligning a query protein sequence with a template consisting of a set of pre-selected protein structures in a database, comprising the steps of:

selecting an energy function, said energy function being a sum of energy parameters and weighting factors;

determining values for weighting factors in said energy function;

establishing linear programming (LP) constraints for threading (or aligning) said query protein sequence with each structure in said set of pre-selected protein structures in a database;

and performing a linear programming analysis based on a linear programming formulation including said energy function under said constraints, to optimally align said query protein with said template.

Meller et al teach scoring method for sequence-to-structure alignments with parameters optimized by linear programming (LP). The method comprises steps of selecting an energy functions including energy parameters and weighting factors, determining values for weighting factors in said energy function (see pp. 242-244), using linear programming to design optimal scoring functions (see pages 243, 246). The linear programming using training sets (see, for example, p. 244, left column, pages 245-246) to determine weighting factors and uses various constraints (see e.g., Table II, or p. 243, last paragraph, or p. 245, right column, or p. 248, left column last line)). The linear programming analysis is based on a linear programming formulation including said energy function under said constraints, to optimally align said query protein with said template.

6. Claims 3-7,11,13 are rejected under 35 U.S.C. 103(a) as obvious over Meller et al in view of Akutsu et al. in view of Akutsu et al. (On the Approximation of Protein Threading. RECOMB, 1997, p. 3-8)

The reference of Meller et al is applied as above.

With respect to claims 3-7,11,13 if there are any differences between Applicant's claimed method and that of the prior art, the differences would be appear minor in nature. Although the prior art do not teach the various limitations of linear programming analysis and graph analysis, it would be conventional and within the skill of the art to select and/or determine such conditions as their selection for the intended purpose of obtaining successful protein threading algorithm is well known in the art; and the selection of appropriate parameters for linear programming is conventional and within the skill in the art to which this invention pertains. See Akutsu et al, for example.



7. Claim 12 is rejected under 35 U.S.C. 103(a) as obvious over Meller et al in view of Ding et al (Bioinformatics, Vol. 17, No. 4, 349-358, 2001).

The reference of Meller et al is applied as above. Meller et al do not teach further performing fold analysis using support vector machines. The reference teaches however, that the described threading protocol can be used as a part of more complex fold recognition algorithm (p. 241, last line). Ding et al describes that support vector machines are effective tools in recognizing protein folding. See abstract. Thus, it would be *prima facie* obvious to one skilled in the art to be motivated to use support vector machines to identify proteins folds of the query protein as further identification of the protein sequence that has been partially identified by the method of Meller et al.

***Conclusion.***

No claims are allowed

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Borin whose telephone number is (571) 272-0713. The examiner can normally be reached on 9am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ardin Marschel, Ph.D., can be reached on (571) 272-0718. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'MBorin', with a line extending from the end of the signature towards the text to its right.

Michael Borin, Ph.D.  
Primary Examiner  
Art Unit 1631

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